What is claimed is:

1. A gate position sensor, comprising:

a transmitter for transmitting a signal in a mass flow controller, wherein a position of a gate in the flow controller affects the signal; and

a receiver for receiving the signal, wherein the receiver provides an indication of a gate position within the mass flow controller based on the signal received.

2. The sensor of claim 1, wherein the transmitter is a device for applying electric potential across the gate and an orifice in the flow controller, the signal is electric current flowing through a junction formed by the orifice and the gate formed when the gate is closed, and the receiver is a current detector for detecting current flowing through the junction.

3. The sensor of claim 1, wherein the transmitter is a physical wave generator, the signal is a physical wave propagating through a junction formed by the orifice and the gate when the gate is closed, and the receiver is a physical wave receiver for detecting the physical wave propagating through the junction.

4. The sensor of claim 1, wherein the transmitter is a light source, the signal is a light signal transmitted by the light source, and the receiver is a light detector operably positioned with respect to the light source and the orifice such that movement of the gate oscillating between an opened position and a closed position interrupts the light signal from being received by the light detector.

5. The sensor of claim 1, wherein the transmitter is a magnet, the signal is magnetic flux from the magnet, and the receiver is a combination of a cooperating

induction coil and an electromagnetic pulse detector for detecting a magnetically induced signal in the induction coil, and wherein gate movement induces the signal by providing relative movement between the magnet and the coil.

6. A gate position sensor for a flow controller having an orifice and a gate for closing the orifice, comprising:

a device for applying an electrical potential across the orifice and the gate; and

a current detector for detecting current flowing through a junction formed by the orifice and the gate when the gate is closed.

7. A gate position sensor for a flow controller having an orifice and a gate for closing the orifice, comprising:

a physical wave generator for generating a physical signal in the flow controller; and

at least one physical wave receiver for detecting the physical signal propagating from the generator based on a relative position of the gate to the orifice.

8. The gate position sensor of claim 7, wherein the receiver detects when the gate is in a closed position by sensing an increased amplitude in the physical signal received by the receiver.

9. The gate position sensor of claim 7, wherein the physical wave receiver detects a complex wave formed from a superposition of a first physical signal propagated through a structure when the gate is in an opened positioned and a second physical signal directly propagated from the physical wave generator to the physical wave receiver when the gate is in a closed position.

10. The gate position sensor of claim 7, wherein the physical wave generator and the physical wave receiver include piezoelectric crystals.

11. The gate position sensor of claim 7, wherein the physical wave generator is the gate such that closing the gate generates a physical wave detectable by the physical wave receiver.

12. A gate position sensor for a flow controller having an orifice and a gate for closing the orifice, comprising:

a light source positioned on a first side of the orifice; and

a light detector positioned with respect to the light source and the orifice such that movement of the gate oscillating between an opened position and a closed position interrupts a light signal generated by the light source from being received by the light detector.

13. A gate position sensor for a flow controller having an orifice and a gate for closing the orifice, comprising:

a magnet;

a cooperating induction coil operably positioned with respect to the magnet, wherein the magnet and the induction coil are operably positioned with respect to the gate of the flow controller; and

an electromagnetic pulse detector such that movement of the gate generates a magnetically induced signal in the induction coil detectable by the detector.

14. The electromagnetic gate position sensor of claim 13, wherein the magnet is selected from the group essentially consisting of: a permanent magnet and an electrically activated magnetic coil.

15. A system, comprising:

an inflow line;

a flow controller positioned in the inflow line for controlling flow, the flow controller including a gate and an actuator for moving the gate to control flow;

a gate position sensor for monitoring whether the gate is in an opened position or a closed position, the sensor including means for transmitting a signal in the flow controller such that a position of the gate in the flow controller affects the signal, and means for receiving the signal and providing an indication of a gate position within the mass flow controller based on the signal received; and

a processor for controlling the position of the gate and for interfacing with the sensor.

16. The system of claim 15, wherein the sensor includes a device for applying an electrical potential across an orifice and the gate in the flow controller, and further includes a current detector, wherein a current flows through a junction formed by the orifice and the gate when the gate is closed, and wherein the current detector detects the current flow through the junction.

17. The system of claim 15, wherein the sensor includes a physical wave generator and a physical wave receiver, and wherein the physical wave generator generates a physical signal, at least one physical wave receiver receives the physical signal, and the physical wave receiver detects the physical signal propagating from the generator through a junction formed by the orifice and the gate when the gate is closed.

18. The system of claim 15, wherein the sensor includes a light source and a light detector, wherein the light source and the light detector are operably positioned with respect to each other and the orifice such that movement of the gate oscillating

between an opened position and a closed position interrupts the light signal from being received by the light detector.

19. The system of claim 15, wherein the sensor includes a magnet, a cooperating induction coil, and an electromagnetic pulse detector, wherein the magnet and the induction coil are operably positioned with respect to the gate, and wherein movement of the gate generates a magnetically induced signal in the induction coil detectable by the electromagnetic pulse detector.

20. The system of claim 15, wherein:

the system includes a processing chamber;

the inflow line includes a gas line coupled to the processing chamber;

the flow controller includes:

an orifice;

a gate for controlling gas flow through the orifice; and

an actuator for oscillating the gate between an opened position and a closed position to control gas flow.

21. A semiconductor manufacturing system, comprising:

an ultrasonic semiconductor gas line;

a processing chamber coupled to the gas line;

a flow controller positioned in the gas line, wherein the flow controller further includes:

an orifice;

a gate for controlling gas flow through the orifice and into the processing chamber;

an actuator for oscillating the gate between an opened position and a closed position to control gas flow;

a transmitter for transmitting a signal in the flow controller; and

a receiver for receiving the signal such that the receiver provides an indication of whether the gate is in an opened position or a closed position based on the signal received; and

a processor for controlling the position of the gate and for interfacing with the gate position sensor.

22. The semiconductor manufacturing system of claim 21, wherein the transmitter is a device for applying electric potential across the gate and an orifice in the flow controller, the signal is electric current flowing through a junction formed by the orifice and the gate when the gate is closed, and the receiver is a current detector for detecting current flowing through the orifice / gate junction.

23. The semiconductor manufacturing system of claim 21, wherein the transmitter is a physical wave generator, the signal is a physical wave propagating through a junction formed by the orifice and the gate when the gate is closed, and the receiver is a physical wave receiver for detecting the physical wave propagating through the junction.

24. The semiconductor manufacturing system of claim 21, wherein the transmitter is a light source, the signal is a light signal transmitted by the light source, and the receiver is a light detector such that movement of the gate oscillating between an opened position and a closed position interrupts the light signal from being received by the light detector.

25. The semiconductor manufacturing system of claim 21, wherein the transmitter is a magnet, the signal is magnetic flux from the magnet, and the receiver is a combination of a cooperating induction coil and an electromagnetic pulse

detector for detecting a magnetically induced signal in the induction coil, wherein the magnet and the cooperating induction coil are operably positioned with respect to the gate such that a movement of the gate induces the magnetically induced signal in the induction coil by providing relative movement between the magnet and the coil.

26. A method, comprising:

providing a mass flow controller in an ultrasonic mass flow line;

oscillating a gate in the mass flow controller at a desired frequency between an opened position and a closed position in order to control flow in the mass flow line; and

monitoring gate movement.

27. The method of claim 26, wherein monitoring gate movement includes verifying an actual gate position against a desired gate position.

28. The method of claim 26, wherein monitoring gate movement includes transmitting a signal in the mass flow controller, receiving the signal, and determining whether the gate is opened or closed based on the signal received.

29. The method of claim 26, wherein oscillating a gate at a desired frequency includes varying a duty cycle to adjust mass flow through the mass flow controller.

30. A semiconductor processing method for delivering a semiconductor gas, comprising:

providing a mass flow controller in an ultrasonic semiconductor gas flow line;

oscillating a gate in the mass flow controller between an opened position and a closed position to control semiconductor gas flow; and

monitoring operation of the gate by transmitting a signal, receiving the signal, and determining whether the gate is opened or closed based on the signal received.

31. The method of claim 30, wherein

transmitting a signal includes applying electric potential across the gate and an orifice in the flow controller, and

receiving the signal includes the step of detecting current flowing through a junction formed by the orifice and the gate when the gate is closed.

32. The method of claim 30, wherein

transmitting a signal includes generating a physical wave in the mass flow controller using a physical wave generator,

receiving the signal includes receiving a physical wave in the mass flow controller using a physical wave receiver, and

determining whether the gate is opened or closed includes determining whether a position of the gate based on a detected physical wave signal.

33. The method of claim 30, wherein

transmitting a signal includes transmitting a light signal in the mass flow controller,

receiving a signal includes receiving the light signal, and

determining whether the gate is opened or closed includes determining a positioned of the gate based on a detected light signal.

34. The method of claim 30, wherein

transmitting a signal includes producing magnetic flux,

receiving a signal includes detecting a magnetically induced signal in a cooperating induction coil positioned within the magnetic flux, and

determining whether the gate is opened or closed includes determining that the gate has moved based on a detected signal in the induction coil.

35. A method for detecting a gas flow failure in a semiconductor manufacturing process, comprising:

providing a flow controller in a semiconductor gas inflow line;

oscillating a gate in the flow controller to control flow; and

monitoring the gate to detect gate operability.

36. The method of claim 35, wherein monitoring the gate includes verifying an actual gate position against a desired gate position.

37. The method of claim 35, wherein monitoring the gate includes transmitting a signal, receiving the signal, and determining whether the gate has moved or is moving based on a received signal.

38. The method of claim 35, wherein the monitoring the gate includes determining that the gate is either stuck in an open position or stuck in a closed position.